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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,903	11/17/2006	Josef Pozivil	M03B334	5002
20411 7590 07/17/2009 The BOC Group, Inc. 575 MOUNTAIN AVENUE MURRAY HILL, NJ 07974-2082				
EXAMINER BAYOU, AMENE SETEGNE				
ART UNIT 3746		PAPER NUMBER		
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/582,903

**Applicant(s)**

POZIVIL ET AL.

**Examiner**

AMENE S. BAYOU

**Art Unit**

3746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 May 2009.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-16 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 13 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-85/86)  
Paper No(s)/Mail Date 05/06/09  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Inventor's Patent Application  
6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Specification*

1. The abstract of the disclosure is objected to because it contains the word "means". Applicant is reminded of the proper language and format for an abstract of the disclosure. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. Correction is required. See MPEP § 608.01(b).

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4,6-7,9-16 are rejected under 35 U.S.C 103(a) as being unpatentable over Toshiaki (Japanese patent publication JP10121913) in view of Seki (US patent 4015436).
4. In re claim 1, Toshiaki discloses a compressor system including:
  - Rotary liquefied natural gas boil-off compressor ,in figure 1,comprising at least two compression stages (22,24) in series , a gas passage (26) passing through the series of compression stages (22,24) ,the gas passage (26) extending through and being in heat exchange relationship with at least one cooling means (27) disposed between the compression stages (22,24) , wherein the at least one cooling means (27) is a cryogenic cooling means (see abstract).

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Toshiaki, however fails to disclose the following limitation which is taught by Seki:

- Cryogenic cooling means having valve means (7), for controlling flow of coolant into the cooling means in response to the inlet temperature, or a related parameter, of the compression stage (1) downstream of the cooling means to maintain inlet temperature at a temperature between chosen sub –ambient temperature limits, in figure 1 ,abstract and column 2,lines 26-31 and column 2,lines 59-column 3,line 45.

5. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Toshiaki by including a valve system before after the cryogenic cooler but before a stage of a compressor as taught by Seki in order to automatically monitor or adjust the temperature of the working fluid.

6. In re claim 2 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Stepner discloses:

- The cryogenic cooling means comprises an indirect cooling means ,in figure 1.

7. In re claim 3 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Seki discloses:

- The cryogenic cooling means comprises a direct cooling means, in figure 1.It would have been obvious to one skilled in the art at the time the invention was

made to choose a direct cooling (injection) method as taught by Seki because of simplicity that does not require complicated piping line.

8. In re claim 4 Toshiaki in view of Seki as applied to claim 3 disclose the claimed invention:

Seki discloses:

- The direct cooling means comprises a chamber (inherently) having an inlet for the introduction of a cryogenic liquid, in figure 1.

9. In re claim 6 and 7 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention except mentioning that there is a cryogenic cooling means intermediate each pair of successive compression stages. But the compressor of Stepner and Seki is a two stage compressor and It would have been obvious to one having ordinary skill in the art at the time the invention was made to install a cryogenic cooling means (either direct or indirect type based on design choice) in between each pair of successive compressor stages (if there are more stages such as three or more) because it is a mere duplication and it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

10. In re claim 9 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Toshiaki discloses:

- There is a cryogenic cooling means (35) downstream of the final compression stage (35), in figure 2.

11. In re claim 10 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Seki discloses:

- There is a cryogenic cooling means (6) upstream of the first compression stage , in figure 1. It would have been obvious to one skilled in the art at the time the invention was made to include a cryogenic cooler upstream of the first stage of the compressor of Toshiaki as taught by Seki in order to lower the temperature of the incoming gas.

12. In re claim 11 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention since the "compressor" does not specify which compressor stage and the heat exchangers disclosed by both Toshiaki in view of Seki can be considered as forced liquefied natural gas vaporizer.

13. In re claim 12 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Seki discloses:

- A liquefied natural gas storage tank (2) having an outlet for boiled-off natural gas communicating with a compressor (1) the cryogenic cooling means (6) in communication with the liquefied natural gas in the storage tank (2) ,in figure 2.

14. In re claim 13 -16 Toshiaki in view of Seki disclose a method of operating a liquefied natural gas compressor because under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claims, then the method claimed will be considered to be anticipated by the prior art

device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. *In re King*, 801 F.2d 1324,231 MPEP 2112.02. In regards to the temperature range stated in claim 14 please note that Seki teaches the same range in column 2, lines 59-68. In regards to the pressure ratio stated in claim 15 and 16 It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the inlet temperature range for each compressor stage because the choice merely depends on design criteria and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

15. Claims 5 is rejected under 35 U.S.C 103(a) as being unpatentable over Toshiaki in view of Seki as applied to claim 4 further in view of Khan et al. (reissued US patent number 33408).

16. In re claim 5 Toshiaki in view of Seki disclose the claimed invention except the following limitation which is taught by Khan et al:

- The outlet of the direct cooling means (74) communicates with a vessel (100) adapted to disengage particles of liquid from the natural gas, the vessel (100) having an outlet (102) for natural gas communicating with compression stage (86), in figure 2 and column 4, lines 43-45.

17. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Toshiaki and Seki

by installing separator that communicates with the direct heat exchanger as taught by Khan et al in order to separate the gaseous and liquid phases.

18. Claims 8 is rejected under 35 U.S.C 103(a) as being unpatentable over Toshiaki in view of Seki as applied to claim 7 further in view of Sterlini (US patent number 4187899).

19. In re claim 8 Toshiaki in view of Seki disclose the claimed invention except the following limitation which is taught by Sterlini:

- An inlet of a direct cooling means communicates with an outlet of an indirect cooling means , in figure 6.

20. It would have been obvious to one skilled in the art at the time the invention was made to communicate (directly or indirectly) the direct cooling means and the indirect cooling means as taught by Sterlini in order to have heat exchange process and lower the temperature of one of the fluid. Please note that in regards to the limitation "cryogenic cooling", the system of Toshiaki and Seki involve cryogenic cooling.

***Alternate Claim Rejections - 35 USC § 103***

21. Claims 1-4, 6-16 are rejected under 35 U.S.C 103(a) as being unpatentable over Swearingen (US patent number 3889485) in view of Blotenberg (US patent number 4362462).

22. In re claim 1 Swearingen teaches process for liquefying natural gas including:

- Rotary liquefied natural gas boil-off compressor (35,12,19,20),in figure 3,comprising at least two compression stages (35,12) in series , a gas passage (10,11,17) passing through the series of compression stages (35,12,19,20) the



gas passage (10,11,17) extending through and being in heat exchange relationship with at least one cooling means (18) disposed between the compression stages (between 35 and 12 or between 12 and 19) , wherein the at least one cooling means (18) is a cryogenic cooling means (even the temperature of the last stage compressed fluid exiting heat exchanger 18 which is point 22 is  $-230^{\circ}\text{F}$  as indicated in column 7, lines 48-50. See also figure 2). Swearingen ,however fails to teach the following limitation which is taught by Blotanberg :

- There is valve means (38, 48), in figure 2 for controlling (via controller 46, 48) flow of coolant into the cooling means (16, 18) in response to the inlet temperature, or a related parameter, of the next compression stage (12 or 14) next in series downstream of the cooling means (16 or 18) to maintain inlet temperature at a temperature between chosen sub ambient temperature limits, in column 4, lines 29-62.

23. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Swearingen by including a valve system for the inter stage intercoolers as taught by Blotanberg in order to automatically monitor or adjust when needed the correct working temperature of the working fluid.

24. In re claim 3 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- The cryogenic cooling means comprises a direct cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3).

25. In re claim 2 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- The cryogenic cooling means (18) comprises an indirect cooling means (separate flow lines 18a-18d and no fluid mixing), in figure 3.

26. In re claim 3 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen '485 discloses:

- The cryogenic cooling means comprises a direct cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3).

27. In re claim 4 Swearingen in view of Blotanberg as applied to claim 3 disclose the claimed invention:

Swearingen discloses:

- The direct cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3) comprises a chamber

(the mixing chamber of line 10 and discharge of compressor 12) having an inlet (line 10 can be taken as inlet for the mixing chamber) for the introduction of a cryogenic liquid, in figure 3..

28. In re claim 6 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There is a cryogenic cooling means (18) intermediate each pair of successive compression stages (35, 12 and 12, 17), in figure 3.

29. In re claim 7 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There are at least three compression stages (35, 12, 17) in sequence and in that there is at least one direct cryogenic cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3) and at least one indirect cryogenic cooling means (18), in figure 3.

30. In re claim 8 Swearingen '485 in view of Blotanberg '462 as applied to claim 7 disclose the claimed invention:

Swearingen discloses:

- An inlet of a direct cryogenic cooling means (which is discharge from compressor 12) communicates with an outlet of an indirect cooling cryogenic means (which is line 10), in figure 3.

31. In re claim 9 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There is a cryogenic cooling means (18) downstream of the final compression stage (20), in figure 3.

32. In re claim 10 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There is a cryogenic cooling means (18) upstream of the first compression stage (12), in figure 1.

33. In re claim 11 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- The compressor (12) has an intermediate inlet communicating with a forced liquefied natural gas vaporizer (18), in figure 3. Please note that the heat exchanger 18 inherently vaporizes the liquefied natural gas during the process of heat exchange.

34. In re claim 12 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- A liquefied natural gas storage tank (4) having an outlet (33) for boiled-off natural gas (column 8, line 62-63) communicating with a compressor (35) the cryogenic

cooling means (18) in communication with the liquefied natural gas (via line 33) in the storage tank (4) ,in figure 3.

35. In re claim 13-16 Swearingen in view of Blotanberg disclose a method of operating a liquefied natural gas compressor because under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claims, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. *In re King*, 801 F.2d 1324,231 MPEP 2112.02.

In re claim 14,It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the inlet temperature range for each compressor stage since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. In re claim 15 and 16 It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the inlet temperature range for each compressor stage because the choice merely depends on design criteria and also since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

36. Claims 5 is rejected under 35 U.S.C 103(a) as being unpatentable over Swearingen in view of Blotenberg as applied to claim 4 further in view of Khan et al. (reissued US patent number 33408).

37. In re claim 5 Swearingen in view of Blotenberg disclose the claimed invention except the following limitation which is taught by Khan et al:

- The outlet of the direct cooling means (74) communicates with a vessel (100) adapted to disengage particles of liquid from the natural gas, the vessel (100) having an outlet (102) for natural gas communicating with compression stage (86), in figure 2 and column 4, lines 43-45.

38. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Swearingen and Blotenberg by installing separator that communicates with the direct heat exchanger as taught by Khan et al in order to separate the gaseous and liquid phases.

### ***Response to Arguments***

39. Applicant's arguments with respect to claims 1-16 have been considered but are not persuasive.

40. In regards to claim 1, applicant in page 1 and 2 argued that Swearingen teaches a plurality of separate compressors while applicant's compressor is a single compressor having different stages. Examiner respectfully disagrees. Applicant's compressor are at least 4 (see figure 1) each one of which can be considered as separate except that they have a common drive. Applicant didn't specify in the claims that the compressor stages are connected to each other and driven by the same shaft. Applicant in page 2 further

argued that there is no removal of heat of compression in the heat exchanger of Swearingen. Examiner again respectfully disagrees. As can be seen in figure 3 of Swearingen there is heat exchanger 18 where cooling/heating takes place between different fluid flows. Applicant's claim merely state that the compressor gas passage is in heat exchange relation with at least one cooling means but didn't specify that the compressed gas is being cooled. The compressed gas from compressor 20 cools down to -230 °F by a cooling means (18) as it exits the heat exchanger 18 (see column 7, lines 48-52).

### ***Conclusion***

41. Applicant's amendment and the fact that the argument is not persuasive necessitated that, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amene S. Bayou whose telephone number is 571-270-3214. The examiner can normally be reached on Monday-Thursday, 9:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on 571-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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